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Immersive Learning and Linguistic Responses in Students with High Intellectual Abilities: Observations and Stakeholder Perceptions Using the Delightex Platform

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ABSTRACT

This study explored students' observed responses and adult stakeholders' perceptions regarding an immersive learning environment designed using the Delightex platform and its relationship with linguistic competences among students with high intellectual abilities at an educational institution in Guayaquil, Ecuador. A qualitative instrumental case-study design was used. Eleven sixth- and seventh-grade students were observed during six 45-minute sessions, while one school administrator and four teachers from Language and Literature and Educational Technology participated as adult interview informants. Interview data were analysed thematically, and observation findings were summarized descriptively as one participant-level classification per indicator based on the six-session record. Four themes and eleven subthemes were identified. Observation records showed that 10/11 students (90.9%) displayed enjoyment, 9/11 (81.8%) showed interest and motivation, and 8/11 (72.7%) maintained attention and completed all proposed activities. Only 3/11 (27.3%) were classified as independently managing the platform, indicating operational support needs. The combined observational and perception-based evidence suggested that Delightex may support motivation, participation, and contextualised language use within the case examined. Given the small sample, single-site design, absence of pre/post linguistic measures, and participant-level descriptive aggregation, the findings should be interpreted cautiously and examined in future comparative studies.

Keywords: *immersive learning, linguistic competences, high intellectual abilities, Delightex, virtual reality*

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Aprendizaje Inmersivo y Respuestas Lingüísticas en Estudiantes con Altas Capacidades Intelectuales: Observaciones y Percepciones de Actores Educativos Mediante Delightex

RESUMEN

Este estudio exploró las respuestas observadas de los estudiantes y las percepciones de los actores adultos respecto de un entorno de aprendizaje inmersivo diseñado mediante la plataforma Delightex y su relación con las competencias lingüísticas de estudiantes con altas capacidades intelectuales de una institución educativa de Guayaquil, Ecuador. Se utilizó un diseño cualitativo de estudio de caso instrumental. Once estudiantes de sexto y séptimo grado fueron observados durante seis sesiones de 45 minutos, mientras que un directivo y cuatro docentes de Lengua y Literatura e Informática Educativa participaron como informantes adultos en entrevistas semiestructuradas. Las entrevistas se analizaron temáticamente y los registros de observación se resumieron de forma descriptiva mediante una clasificación por estudiante e indicador basada en el registro de las seis sesiones. Se identificaron cuatro temas y once subtemas. Los registros mostraron que 10/11 estudiantes (90,9 %) manifestaron disfrute, 9/11 (81,8 %) mostraron interés y motivación, y 8/11 (72,7 %) mantuvieron la atención y completaron las actividades propuestas. Solo 3/11 (27,3 %) fueron clasificados como usuarios autónomos de la plataforma, lo que evidenció necesidades de apoyo operativo. La evidencia observacional y basada en percepciones sugirió que Delightex puede favorecer la motivación, la participación y el uso contextualizado del lenguaje en el caso estudiado. Debido al tamaño de la muestra, al carácter de sitio único, a la ausencia de medidas lingüísticas pre/post y a la agregación descriptiva por participante, los resultados deben interpretarse con cautela y examinarse en estudios comparativos posteriores.

Palabras clave: *aprendizaje inmersivo, competencias lingüísticas, altas capacidades intelectuales, Delightex, realidad virtual*

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INTRODUCTION

In recent years, immersive technologies have been increasingly used for educational purposes across the Global South, particularly in digital language learning (UNESCO, 2024). The pandemic accelerated the use of virtual reality, augmented reality, and interactive 3D environments in teaching. For students with High Intellectual Ability (HIA), conventional classroom tasks may provide insufficient cognitive challenge when instruction is not differentiated to their learning profiles (Renzulli, 2012; Winner, 1996).

Students with HIA may display advanced reasoning, rapid learning, strong pattern recognition, pronounced curiosity, and development that is not always synchronous across cognitive, social, and emotional domains (Renzulli, 2012; Winner, 1996). From a linguistic perspective, the educational challenge is to provide opportunities for lexical, semantic, and pragmatic elaboration commensurate with the level of cognitive challenge required by this population. When learning tasks are insufficiently differentiated, some highly able learners may show disengagement or underachievement; these outcomes should not be generalized to all students with HIA (Winner, 1996).

Immersive learning environments offer a structurally different response to this challenge. By placing students in interactive, multisensory digital spaces, these environments can support embodied interaction, sustained attention, and contextualized linguistic encounters that go beyond decontextualized practice activities (Mayer, 2021). Delightex Edu provides a three-dimensional environment with visual coding and virtual and augmented reality features, supporting the creation of interactive learning scenarios across common digital devices (Delightex Edu, n.d.). However, evidence regarding its use for linguistic learning among students with HIA remains limited.

This study explored this issue through a qualitative case study at Unidad Educativa Particular

Minerva in Guayaquil, Ecuador. Rather than testing causal influence, the study examined students' observed behavioral and attitudinal responses during Delightex-supported language activities and adult stakeholders' perceptions of the platform's contribution to lexical, semantic, and pragmatic linguistic competences among sixth- and seventh-grade students with HIA.

Immersive learning proposes a pedagogical dynamic in which learners become integrated into a digital environment that responds to their actions, stimulating cognitive and affective engagement through multisensory integration (Priego Álvarez et al., 2023). Theoretically, Mayer's (2021) Cognitive Theory of Multimedia Learning suggests that coordinated visual and auditory processing may support deeper encoding when multimedia materials are appropriately designed. In the present study, cognitive load was not measured; therefore, any potential reduction in extraneous cognitive load is treated as a theoretical possibility rather than an observed outcome.

Within immersive learning, three-dimensional exploration (Romano, 2021), augmented and virtual reality (Merchán Freire & Valero Díaz, 2024), transmedia storytelling (Arias & Saltos, 2024), and gamification (Gaspar Huamaní, 2021) can function as complementary mechanisms for engagement and interaction. Delightex Edu brings 3D creation, visual coding, and virtual and augmented reality into a single educational platform, allowing educators to design sequential, challenge-based scenarios that combine contextual storytelling with interactive tasks (Delightex Edu, n.d.).

In this regard, linguistic competence encompasses lexical, semantic, and pragmatic dimensions that enable individuals to understand, construct, and use language in context (Fernández, 2023). Its development depends on the quality of language exposure and production experiences, being most effective when the stimuli are meaningful and appropriate

to the learner's level (Krashen, 2003, as cited in Fernández, 2023). Likewise, Mantilla et al. (2021) emphasize that reading comprehension mobilizes inferential, metacognitive, and semantic processes; therefore, immersive environments, by incorporating three-dimensional contextual cues, facilitate meaning construction and enhance language learning, particularly among students with High Intellectual Ability.

Similarly, students with HIA may display advanced cognitive processing, high metacognitive capacity, and sensitivity to intellectual challenge (Renzulli, 2012; Winner, 1996). From a neuroeducational perspective, Solórzano et al. (2024) argue that novelty and complexity can contribute to engagement, whereas repetitive activities may reduce motivation. In line with cognitive theories of multimedia learning, interactive and gamified scenarios may facilitate exploration, inference, and self-regulation when their design aligns with learners' needs (Mayer, 2021).

Furthermore, Delightex Edu is an educational platform that allows users to create interactive three-dimensional environments, animate them through visual coding, and explore them in virtual and augmented reality (Delightex Edu, n.d.). In language teaching, such narrative scenarios can create opportunities for learners to infer, solve challenges, and apply linguistic knowledge in meaningful situations, consistent with language acquisition perspectives focused on production and communicative interaction (Swain, 2005, as cited in Fernández, 2023).

Nevertheless, despite the growing body of evidence regarding the potential of immersive technologies to support language learning (Díaz et al., 2025; Zambrano Baluarte et al., 2024), studies focusing on students with High Intellectual Ability in Latin American contexts remain limited. Within this context, the general objective of the present study was to explore the observed behavioral and attitudinal responses of students with HIA during a Delightex-based immersive language experience and the perceptions of adult stakeholders regarding its

potential contribution to linguistic competences at Unidad Educativa Particular Minerva.

To achieve this objective, the study sought to: (1) describe the implementation of the Delightex immersive environment and students' observed behavioral and attitudinal responses; (2) examine teachers' and the school administrator's perceptions of the platform's relationship with lexical, semantic, and pragmatic language use; and (3) identify pedagogical, operational, and technological conditions affecting implementation, including usability, technical induction, and connectivity. These objectives align with the classroom observations and semi-structured interviews reported in the methods.

MATERIALS AND METHODS

The present study employed an interpretive approach in accordance with the qualitative research paradigm (Creswell & Poth, 2018). Within this framework, an instrumental case study was adopted to investigate a contemporary phenomenon in its real-life context (Stake, 1995; Simons, 2020). Exploratory, descriptive, and field components were incorporated to characterize behavioral and attitudinal responses in the natural classroom environment without manipulating variables (Muntané Relat, 2023; Guevara Alban et al., 2020; Arias Odón, 2020). Data interpretation was conducted through thematic analysis, as described below.

The study was conducted in a private elementary education institution in Guayaquil, Ecuador. Three sixth- and seventh-grade classrooms were selected because they included institutionally identified students with HIA. The case comprised 16 participants selected through purposive sampling: eleven students (six females and five males) and five adult key informants, consisting of one school administrator and four teachers of Language and Literature and Educational Technology. The students' HIA identification predated the study and was based on psychoeducational records held by the school's guidance department; the research team did not conduct a new diagnostic assessment. The institutional records consulted for the study did

not specify the diagnostic instruments, assessment dates, decision criteria, or credentials of the professionals who conducted those prior assessments; this is acknowledged as a methodological limitation, and the identification protocol is not attributed to the 2015 LOEI. Student inclusion required enrolment in sixth or seventh grade, age between 10 and 12 years, prior institutional HIA identification, legal-guardian consent, student assent, and participation in the scheduled sessions. Adult informants had direct academic contact with the students and experience in Language and Literature or Educational Technology. All eleven students included in the analysis completed all six sessions.

Table 1. Distribution of Participants by Stakeholder Group

Stakeholder Group	Number	% of Total
School Principal	1	6.25%
Language and ICT Teachers	4	25.00%
Students with HIA (6th and 7th Grade)	11	68.75%
Total	**16**	**100.00%**

Note. participant selection was purposive. Adult informants provided informed consent; legal guardians provided consent for students, and students provided assent. All eleven students included in the analysis completed six 45-minute sessions.

Data were collected using a semi-structured interview guide for the five adult informants and a systematic observation checklist applied to the eleven students. The interview consisted of 12 open-ended questions organized around the pedagogical possibilities of immersive technology, the Delightex environment, and implementation conditions. The semi-structured guide and observation checklist underwent content validation by three experts with experience in linguistics, High Intellectual Ability, qualitative methodology, and educational technology, who reviewed clarity, relevance, coherence, and alignment with the study objective. Participant observation used nine indicators related to motivation, attention, technological interaction, and task completion, assessed through a three-level ordinal scale (MR = Meets

Requirements, NMR = Nearly Meets Requirements, and NI = Needs Improvement). Each student was observed during six 45-minute sessions in the selected classrooms, with field notes complementing the checklist. No distinct calibration sample was documented; therefore, no calibration data are included in the reported results.

The interviews and field notes were analysed using the six phases of thematic analysis described by Braun and Clarke (2006): first, familiarisation with the transcribed interviews and observation records; second, generation of initial codes; third, grouping related codes into candidate themes; fourth, review of candidate themes against the transcripts and field records; fifth, definition and naming of themes; and sixth, integration of the final thematic structure into the report. The final structure comprised four themes and eleven subthemes: Theme 1, enjoyment and interest, sustained attention, and willingness to re-engage; Theme 2, contextualised vocabulary use, semantic relationship building, and feedback-supported semantic processing; Theme 3, pragmatic/written production, inferential reasoning, and activation of prior knowledge in context; and Theme 4, platform usability/technical induction and connectivity/implementation support. Codes and categories were checked against the source material, and discrepancies were discussed until a shared interpretation was reached. Observation data were summarized descriptively. For each of the nine indicators, Table 2 reports one participant-level classification per student (n = 11) based on the six-session record; the study records did not document a reproducible session-to-participant aggregation rule, so these counts are treated as descriptive participant-level summaries rather than 66 independent session observations. Credibility was supported by triangulating adult interviews with student observation records, while dependability and confirmability were supported through documented coding and category-development decisions (Lincoln & Guba, 1985).

From an ethical standpoint, the study adhered to the Ecuadorian Code of Childhood and

Adolescence and the institutional protocols of the University of Guayaquil, ensuring confidentiality and voluntary participation (Congreso Nacional del Ecuador, 2014). Adult informants and legal guardians provided informed consent, and students provided assent. No ethics committee name, approval code, or approval date was recorded in the study documentation; accordingly, no approval identifier is reported.

To promote the development of linguistic competencies among students with HIA, an instructional proposal entitled Immersive Delightex Environment for Linguistic Competencies was designed to translate the principles of contextualized, challenge-based learning into a sequence of activities aimed at sixth- and seventh-grade students. Content selection was based on the Language and Literature area of the Ecuadorian National Curriculum and focused on four lexical-semantic components: analogies, synonyms, antonyms, and metaphors, due to their relevance for strengthening linguistic competence and their close relationship with the inferential and figurative processes characteristic of advanced cognitive development.

Accordingly, nine sequential virtual scenarios were designed in Delightex and articulated through a narrative inspired by the Seven Wonders of the Ancient World, a theme selected for its capacity to stimulate curiosity and facilitate the three-dimensional representation of content. The scenarios incorporated interactive objects and assessment activities centered on linguistic competences. Through these activities, students engaged in tasks involving analogical reasoning, synonymic and antonymic relationships, and metaphor comprehension and production. Finally, students were required to construct an alternative ending, thereby adding a higher-level language-production challenge.

For the technical and audiovisual development of the immersive proposal, nine virtual scenarios were created in Delightex using visual/block-based programming to configure interactive elements, characters, animations, texts, images, videos, and assessment activities.

Audiovisual resources were edited in Filmora, and narrative sequences generated with Grok AI were incorporated into the scenarios. The exact Grok model/version and a formal AI-content safeguard protocol were not documented in the study records; generated sequences were subsequently edited in Filmora before classroom use. A formal economic evaluation was not conducted, and the study documentation did not contain itemized cost components, pricing date, currency basis, or user coverage; therefore, no implementation-cost estimate is reported.

RESULTS AND DISCUSSION

Observational Data: Students' Behavioral and Attitudinal Responses

Table 2 presents the participant-level descriptive summaries from the systematic observation checklist across the six implementation sessions. The three-level rating scale (MR = Meets Requirements; NMR = Nearly Meets Requirements; NI = Needs Improvement) was used for nine behavioral and attitudinal indicators among the eleven participating students.

Table 2. Aggregated Results of the Systematic Observation (n = 11 Students)

#	Observation Indicator	MR	NMR	NI	Total
1	Collaborative interaction with peers during the immersive activity	7	3	1	11
2	Interest and motivation while using Delightex	9	2	0	11
3	Maintained attention throughout the activity	8	2	1	11
4	Understanding of the virtual environment instructions	6	4	1	11
5	Appropriate interaction with immersive elements	7	3	1	11
6	Independent management of the platform (without substantial confusion or assistance)	3	5	3	11
7	Enjoyed expressing the immersive experience	10	1	0	11
8	Willingness to use Delightex again in future sessions	9	2	0	11
9	Completed all proposed activities within the environment	8	2	1	11

Note. MR = Meets Requirements; NMR = Nearly Meets Requirements; NI = Needs Improvement. The table reports one participant-level classification per indicator for the eleven students after the six-session observation record. Because the study records did not document a reproducible session-to-participant aggregation rule, the table is interpreted descriptively at participant level. Indicator 6 was reworded in the positive direction (independent management of the platform) so that MR consistently denotes the more favorable performance category. **Source**: Authors.

The findings show predominantly positive observed responses within this small case. Indicator 7 (enjoyment) achieved an MR score of 10/11 (90.9%), while Indicator 2 (interest and motivation) and Indicator 8 (willingness to use Delightex again) each obtained 9/11 (81.8%). These observations describe the implementation sessions only; a novelty effect cannot be ruled out because no longitudinal or comparison condition was used.

Sustained attention (Indicator 3) reached an MR score of 8/11 (72.7%), and task completion (Indicator 9) also reached 8/11 (72.7%). The concurrence of these indicators suggests that attention and task completion coincided with positive motivational responses; the design does not establish that motivation caused task performance.

Indicator 6, reworded as independent management of the platform without substantial confusion or assistance, recorded MR for 3/11 students (27.3%), NMR for 5/11 (45.5%), and NI for 3/11 (27.3%). Thus, only three students were classified as independently managing the platform, while the remaining students required some degree of support. This is reported as an operational usability indicator, not as evidence of a causal barrier.

Interview Findings: Perspectives of Teachers and School Administrators

The thematic analysis of the five adult interviews generated four themes and eleven subthemes concerning stakeholder perceptions of the educational use of Delightex and observed student responses. Because no linguistic pre/post measure or comparison group was used, the interview results are presented as informants' perceptions rather than measured comparative effects.

Theme 1. Motivational Activation and Cognitive Challenge

Adult informants perceived Delightex as engaging for the students and associated the narrative structure, self-directed exploration, and challenge-based progression with positive motivational responses. The three subthemes within Theme 1 were enjoyment and interest,

sustained attention, and willingness to re-engage. These statements reflect informants' perceptions and were not tested against a conventional-instruction comparison condition.

Theme 2. Contextualized Vocabulary Acquisition and Semantic Processing

Informants perceived contextualised vocabulary use and semantic processing during the immersive scenarios. The three subthemes within Theme 2 were contextualised vocabulary use, semantic relationship building, and feedback-supported semantic processing. No linguistic rubric or comparative corpus was applied; therefore, these observations are not presented as measured improvement.

Theme 3. Development of Pragmatic Language Skills and Inferential Reasoning

Interviewees perceived that tasks involving alternative endings, situational problem solving, and indirect expressions supported pragmatic language use and inferential reasoning. The three subthemes within Theme 3 were pragmatic/written production, inferential reasoning, and activation of prior knowledge in context. These interpretations are perception-based and are not treated as evidence of measured linguistic gains.

Theme 4. Limitations, Conditions for Effectiveness, and Scalability

Adult informants identified two implementation subthemes: platform usability and the need for technical induction, and connectivity and implementation support. They described connectivity interruptions and the importance of teacher preparation and curriculum-aligned scenario design. The analytic archive did not retain anonymized verbatim interview excerpts or an interviewee-by-theme frequency matrix; therefore, exact agreement counts and direct quotations are not reported.

The combined observational and interview evidence suggests that the Delightex environment may offer a context-specific pedagogical resource for engaging students with HIA in language-focused activities. The observed counts - 10/11 enjoyment, 9/11 interest and motivation, 8/11

sustained attention, and 8/11 task completion - describe responses within the implemented case and should not be interpreted as proof of effectiveness or superiority to conventional instruction. These findings are broadly compatible with theoretical and empirical work on multimedia and immersive learning and engagement (Mayer, 2021; Díaz et al., 2025).

The combined evidence suggested that students' participation in immersive tasks was accompanied by contextualized lexical, semantic, and pragmatic language use as perceived by adult informants. Because the study did not include pre/post linguistic measures, a rubric-based outcome assessment, or a comparison group, these observations cannot establish linguistic improvement. The contribution of this case lies in providing preliminary case-based evidence of the applicability of immersive language activities with students with HIA, rather than demonstrating their effectiveness.

Regarding the cognitive bridging function of immersive learning, adult informants perceived that three-dimensional lexical-semantic representations and interactive narratives supported students in connecting abstract language concepts with contextualized experiences. This interpretation is consistent with Mayer's (2021) principles of multimodal learning, but cognitive load and linguistic change were not measured directly. Consequently, Delightex was perceived to support contextualized processing rather than proven to produce more effective learning (Heras, 2024).

These findings are compatible with Príncipe Torres (2022), who presents immersive learning as an alternative educational approach. In this case, Delightex combined contextualized content, exploration, and dynamic representation within the implemented experience. This suggests potential for differentiated educational practices, while the single case does not establish effectiveness across settings.

With respect to operational usability, 10/11 students (90.9%) expressed enjoyment, 9/11

(81.8%) were classified as interested and motivated, and only 3/11 (27.3%) met the criterion for independent platform management. For Indicator 6, MR was interpreted in the positive direction as independent use without substantial confusion or assistance. From the perspective of Sweller's (2011) Cognitive Load Theory, navigation demands may theoretically add extraneous cognitive load, although cognitive load was not measured in this study. The result supports including an initial familiarization phase, not a causal claim about learning.

These findings are consistent with Zambrano Baluarte et al. (2024), who emphasized the importance of teacher training and appropriate technological conditions for immersive learning in basic education. In the present case, connectivity interruptions were noted during implementation, but the study records did not provide a reproducible measure of the proportion of instructional time affected. The observations highlighted the importance of stable connectivity and technical support. Any distinction between platform limitations and contextual implementation conditions remains a tentative interpretation because causal effects were not tested.

Regarding feasibility, the case showed that the planned activities could be carried out with the institution's available devices and support; however, feasibility and cost-effectiveness were not formally evaluated. Because no itemized cost analysis was available, the study does not make claims about affordability beyond the observed operational implementation in the participating institution.

Implications should therefore be limited to the participating institution and educational settings with similar characteristics. The findings may inform cautious pilot use of immersive activities for students with HIA, accompanied by technical induction, curriculum alignment, and evaluation. Scalability and cost-effectiveness remain hypotheses for future research rather than outcomes established by this single-site case.

CONCLUSIONS

Based on the findings of this study, five main conclusions were drawn regarding the observed and perceived outcomes of the Delightex immersive environment among students with High Intellectual Ability (HIA), together with recommendations for educational practice and future research.

First, the observations suggested predominantly positive participation and motivation responses during Delightex sessions. Ten of the eleven students (90.9%) expressed enjoyment, and 9/11 (81.8%) were classified as interested and motivated. These descriptive findings do not establish a statistically significant change or superiority over conventional instruction because no baseline, comparison group, or inferential test was used.

Second, adult informants perceived that the immersive environment supported lexical, semantic, and pragmatic language use during contextualized activities. Because no baseline or post-test linguistic measure was applied, the study does not claim that linguistic competences were strengthened; it reports perceived support for contextualized language use.

Third, usability of the immersive learning environment emerged as an implementation consideration. Only 3/11 students (27.3%) met the criterion for independent platform management, while the remaining students required some degree of support. This finding highlights the need to familiarize learners with the interface and interaction dynamics before instructional implementation.

Fourth, connectivity interruptions were identified as an implementation limitation. This finding highlights the importance of adequate technological infrastructure and reliable Internet access when planning immersive activities. The study did not quantify a causal effect of connectivity on outcomes, and the available records did not retain a reproducible basis for a percentage of affected instructional time.

Finally, the Delightex proposal was considered a feasible context-specific prototype within this case, with curriculum-aligned narrative and challenge-based activities. Its replication, scalability, and cost-effectiveness were not tested, so it should be treated as a prototype for cautious pilot implementation and further evaluation rather than as a replicable low-cost model.

Recommendations and Future Research

Teachers may consider cautious pilot implementation of immersive learning environments, preceded by technical orientation and explicit alignment with curriculum competencies. School administrators should assess connectivity and technological infrastructure before implementation and promote collaboration between language education and educational technology specialists. Policymakers should not infer system-wide effectiveness from this single case; a proportionate recommendation is to support evaluated pilot initiatives and further research before wider adoption.

Future research should adopt mixed-methods or quasi-experimental designs to complement the present qualitative evidence with direct quantitative measures of linguistic competency development. Longitudinal and comparative studies involving other immersive platforms and different student populations are also recommended to examine the transferability and potential scope of the findings.

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